

US009782318B1

(12) **United States Patent**
Hunter, Jr.

(10) **Patent No.:** **US 9,782,318 B1**
(45) **Date of Patent:** **Oct. 10, 2017**

(54) **ARM STABILIZER DEVICE AND METHODS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 607 days.

(21) Appl. No.: **14/268,989**

(22) Filed: **May 2, 2014**

Related U.S. Application Data

(63) Continuation-in-part of application No. 13/717,352, filed on Dec. 17, 2012, now Pat. No. 9,271,862, which is a continuation of application No. 13/087,841, filed on Apr. 15, 2011, now Pat. No. 8,356,601, which is a continuation-in-part of application No. 12/550,701, filed on Aug. 31, 2009, now Pat. No. 8,230,864.

(51) **Int. Cl.**
A61G 13/12 (2006.01)
A61F 5/37 (2006.01)

(52) **U.S. Cl.**
CPC *A61G 13/1235* (2013.01); *A61F 5/3761* (2013.01); *A61G 13/124* (2013.01); *A61G 13/129* (2013.01); *A61G 2210/10* (2013.01); *A61G 2210/50* (2013.01)

(58) **Field of Classification Search**
CPC . *A61G 13/1235*; *A61F 5/0123*; *A61F 5/0125*;

A61F 2005/0139; A61F 5/0102; A61F 2005/0167; A61F 5/0118; A61F 5/05866; A61F 5/10; A61F 13/107; A61F 5/013

See application file for complete search history.

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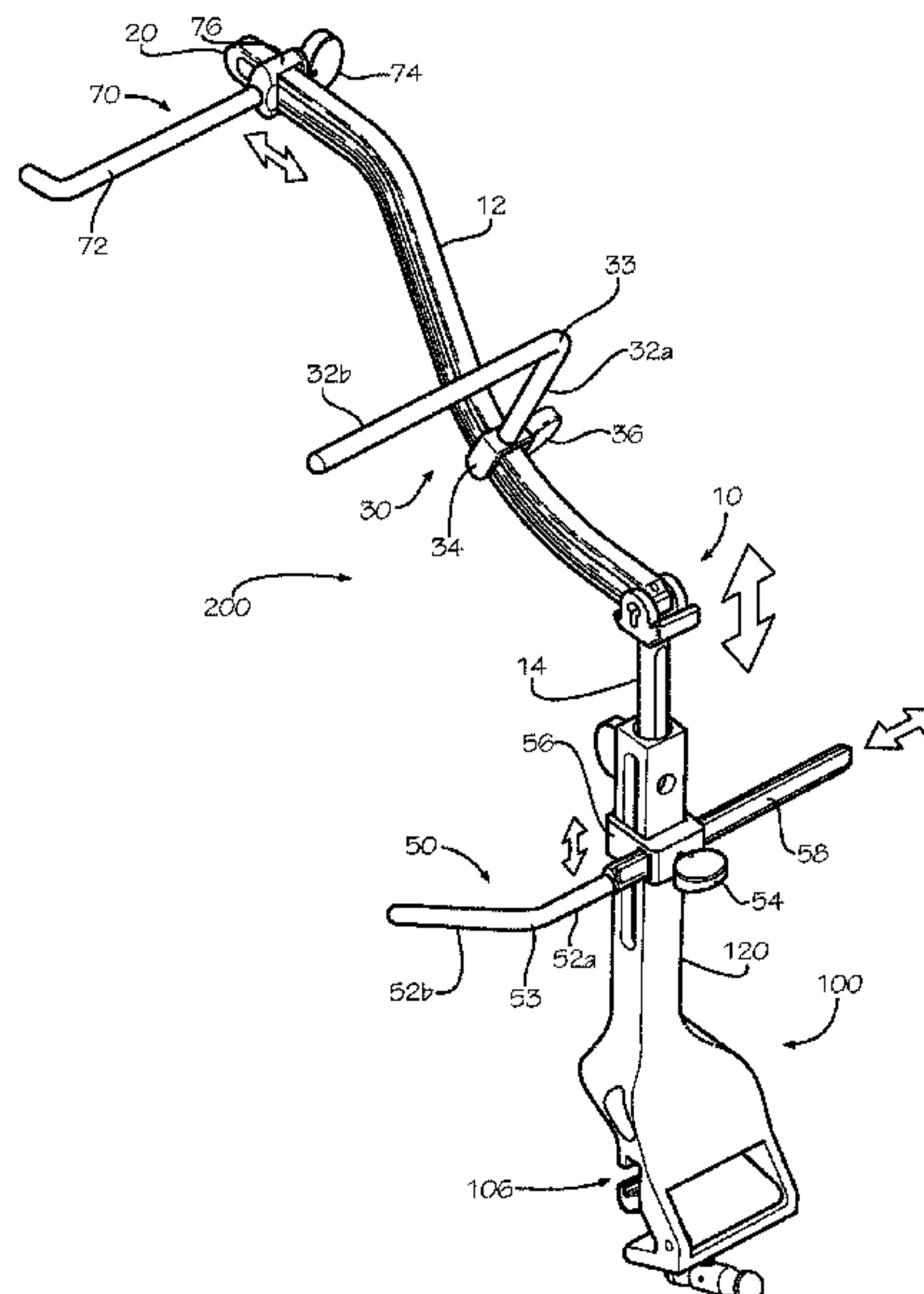
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(57) **ABSTRACT**

A device for supporting a patient's arm includes a rail clamp configured to be secured to a rail or other structure on a table such as an operating table. The rail clamp includes a clamp body and a socket configured to receive a base of an attachment such as a support arm or lateral brace. The base may be inserted longitudinally in the socket on the rail clamp. A stabilizer bar extends from the base in some embodiments. The base is moveable in the socket such that the stabilizer bar may be raised or lowered relative to the rail clamp. One or more modular attachments for supporting various regions of a patient's arm may be secured to the stabilizer bar or the rail clamp.

13 Claims, 17 Drawing Sheets



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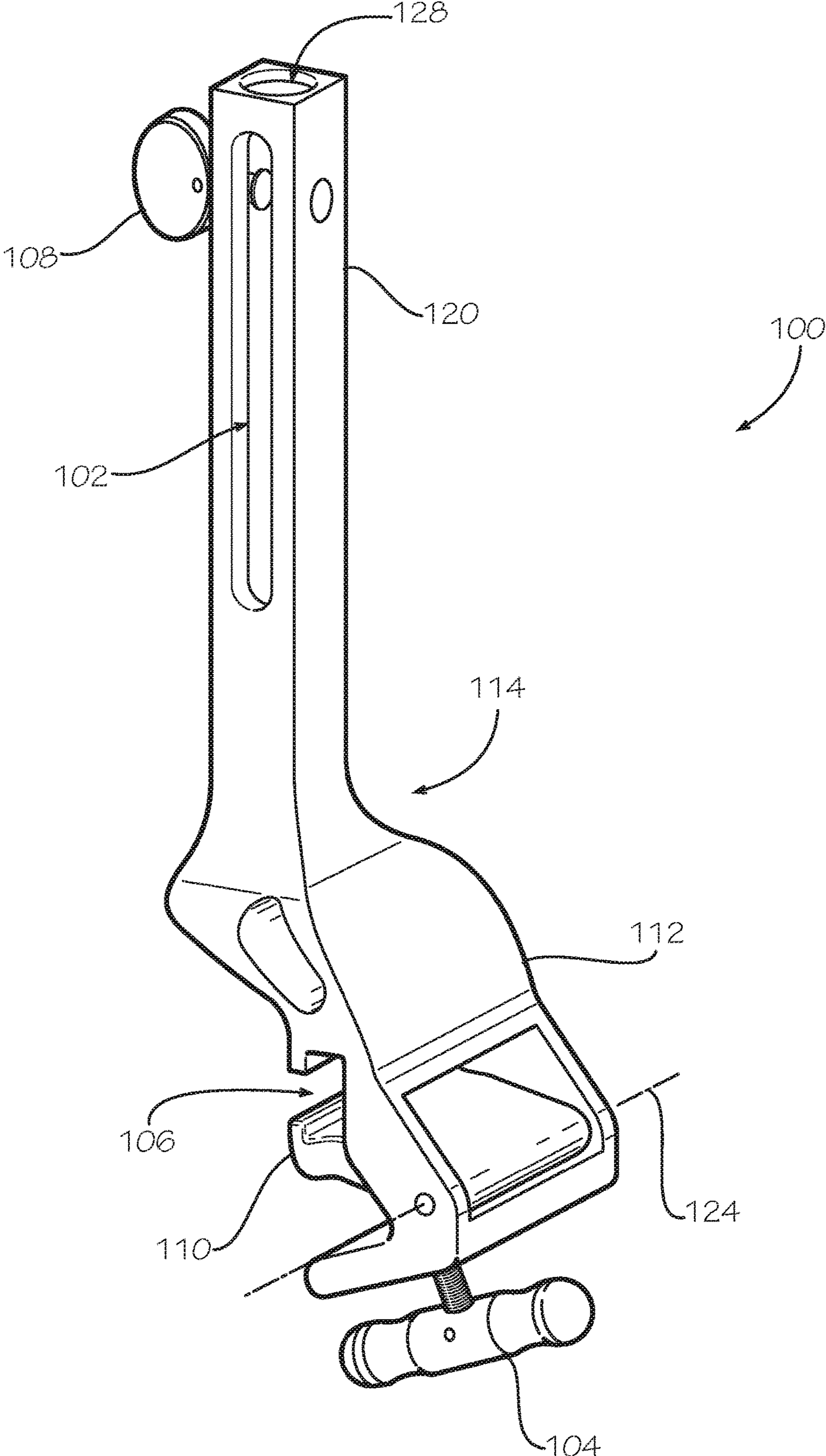


FIG. 1

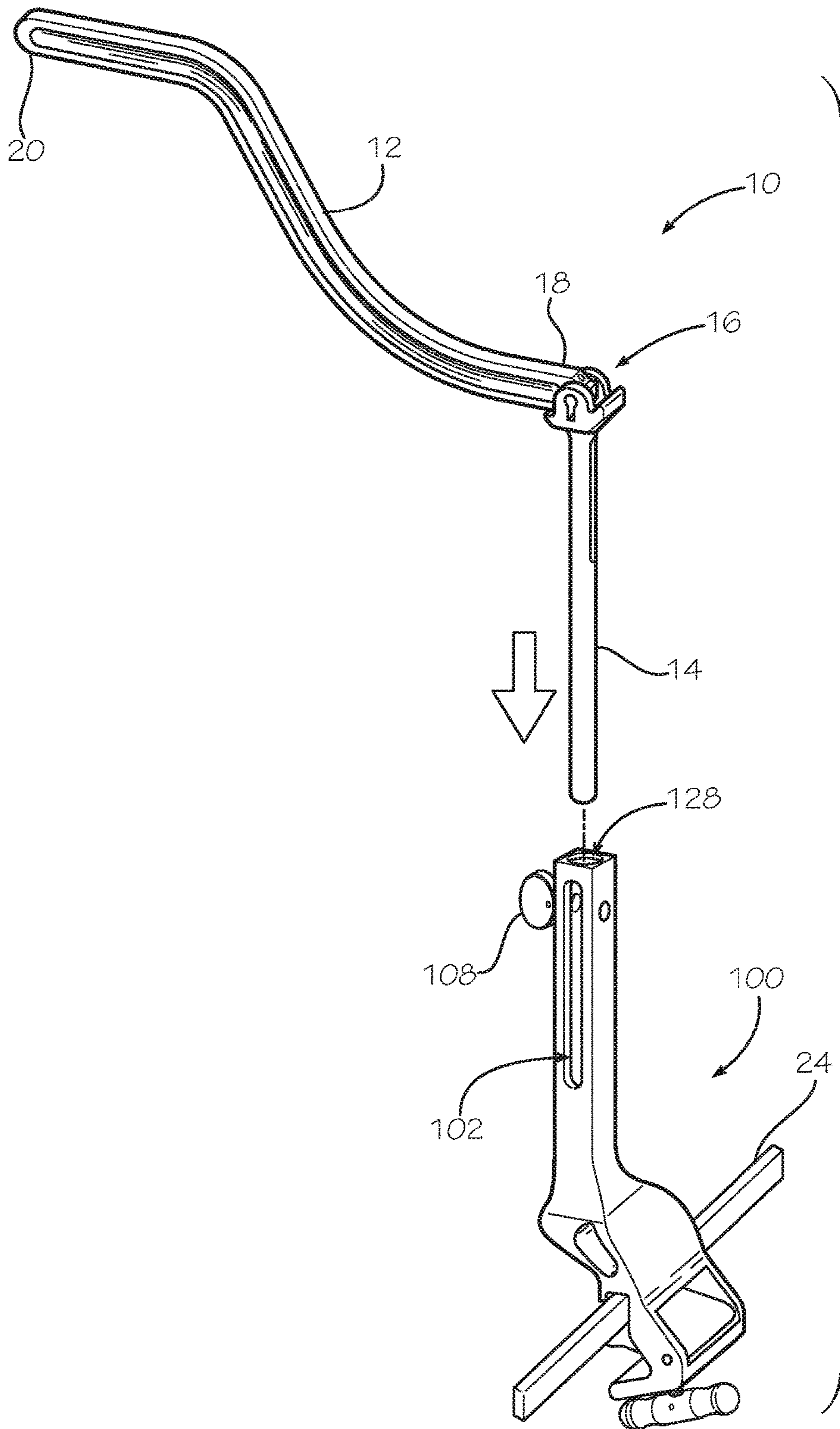


FIG. 2

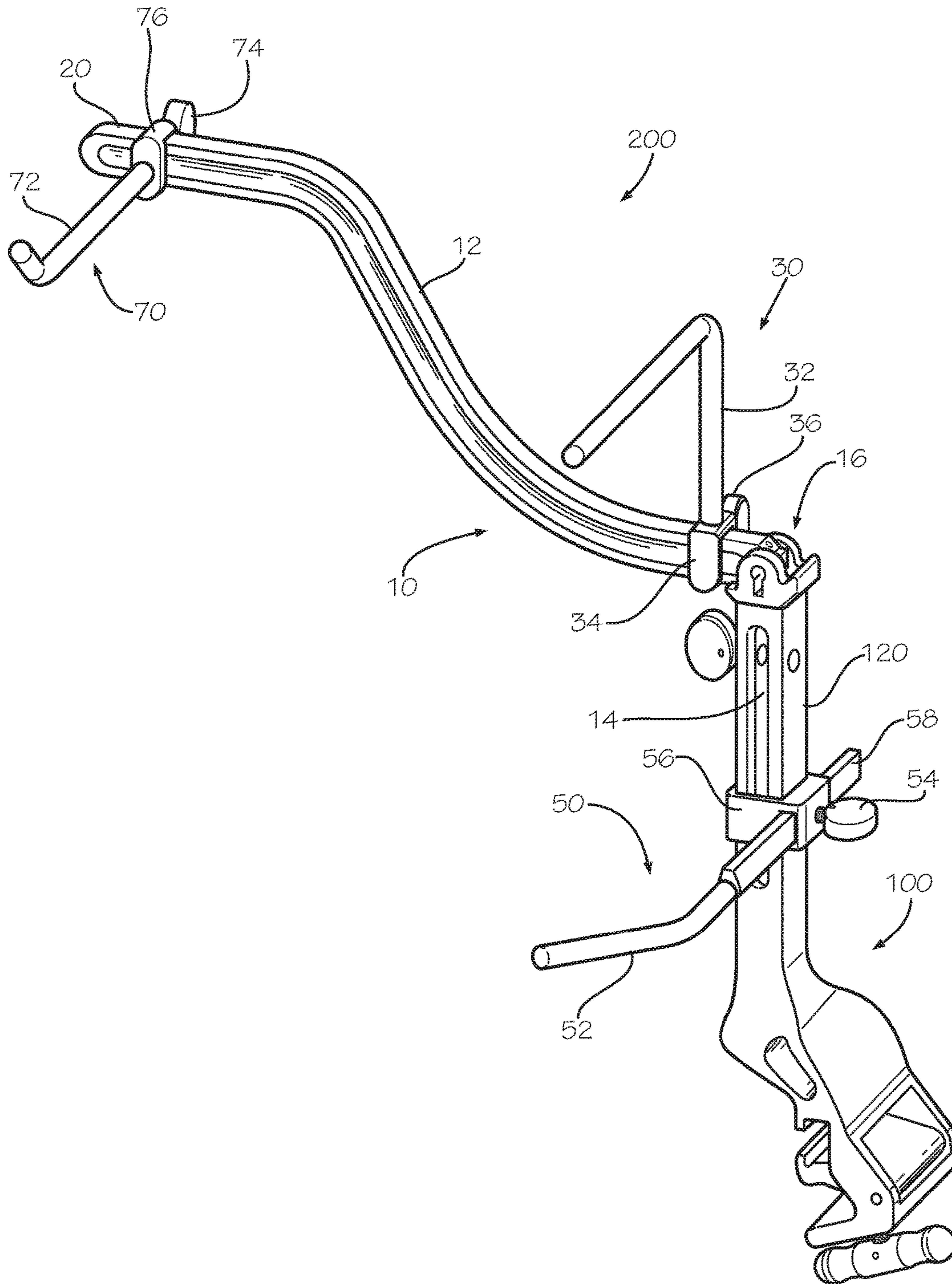


FIG. 3

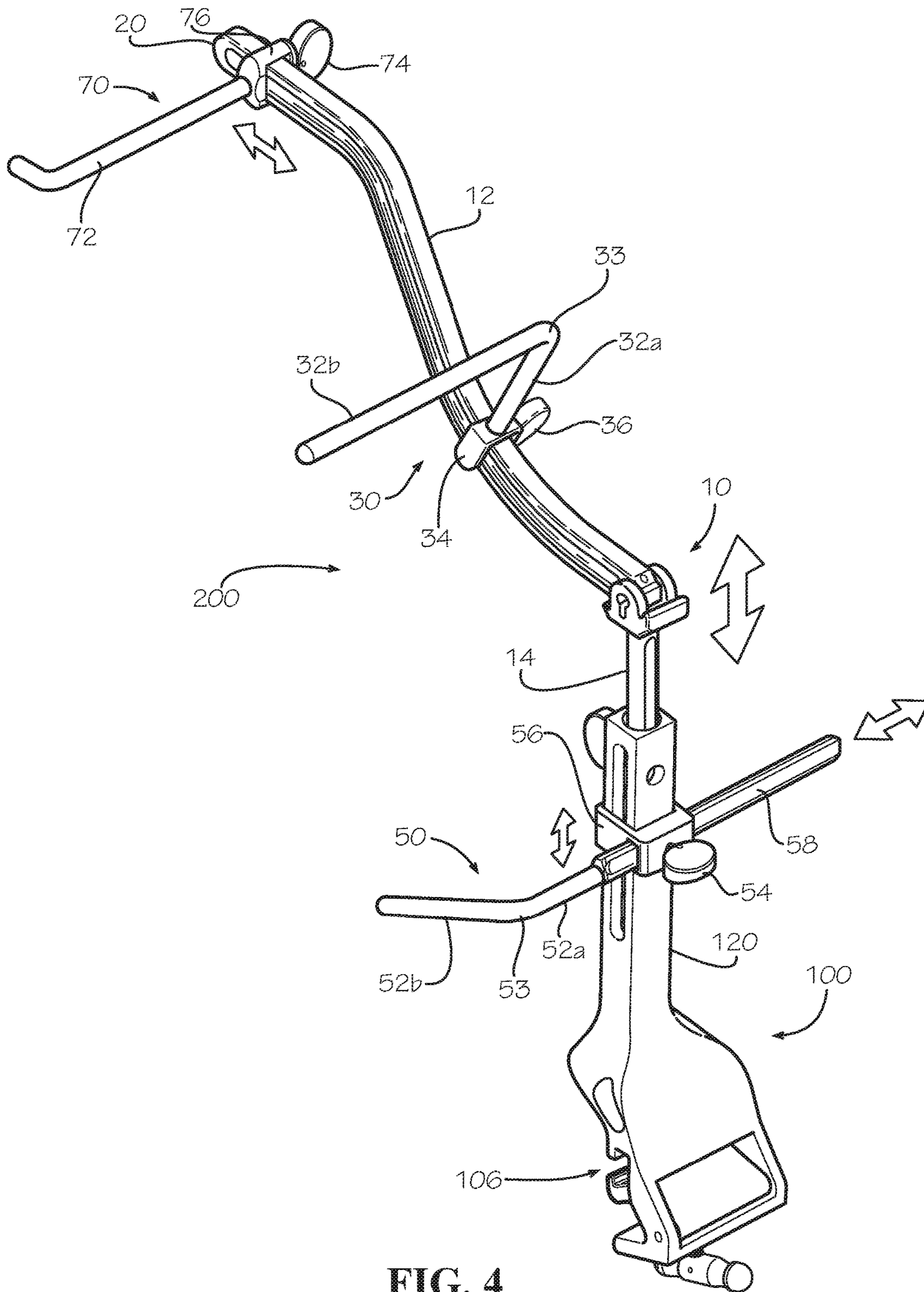


FIG. 4

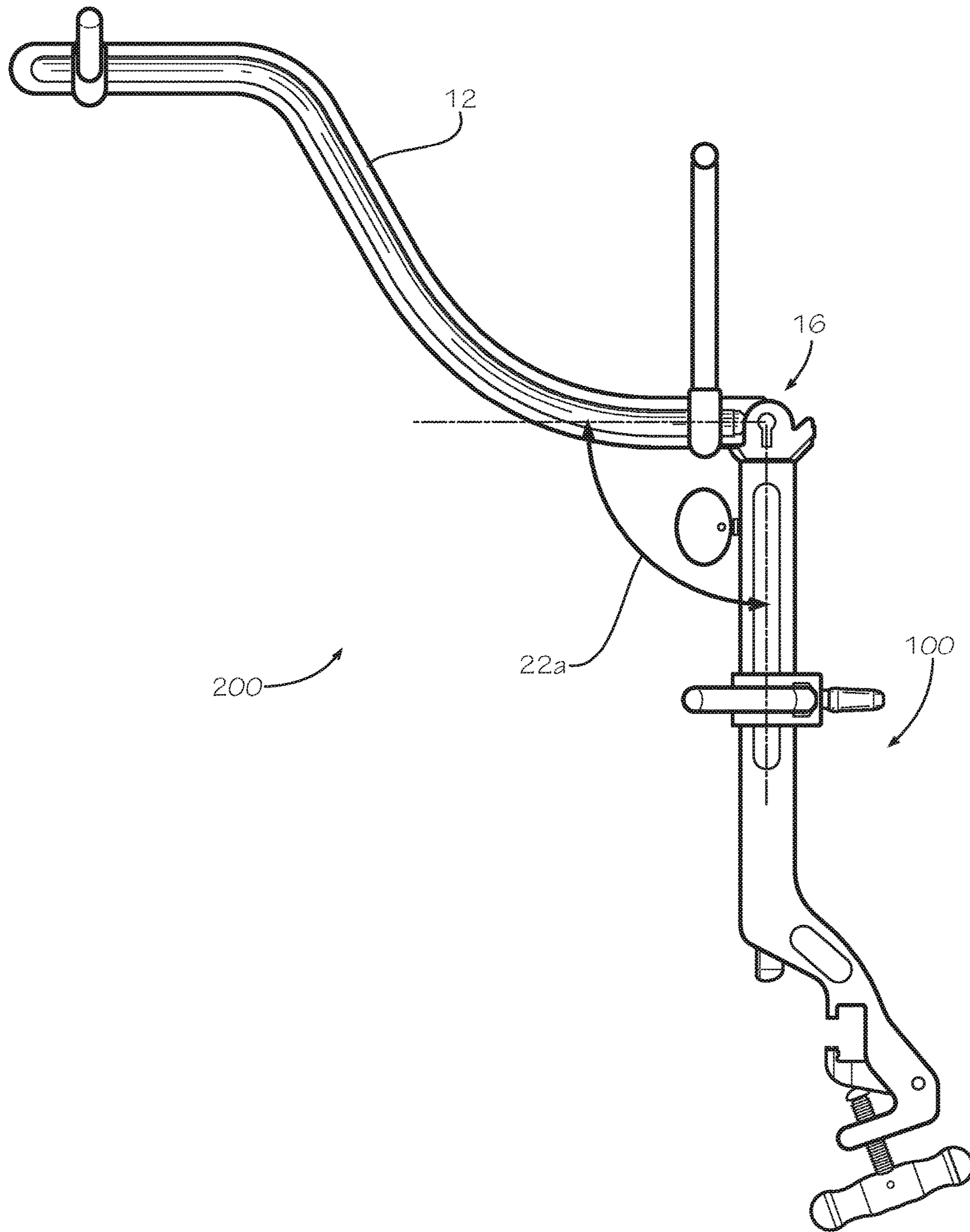


FIG. 5

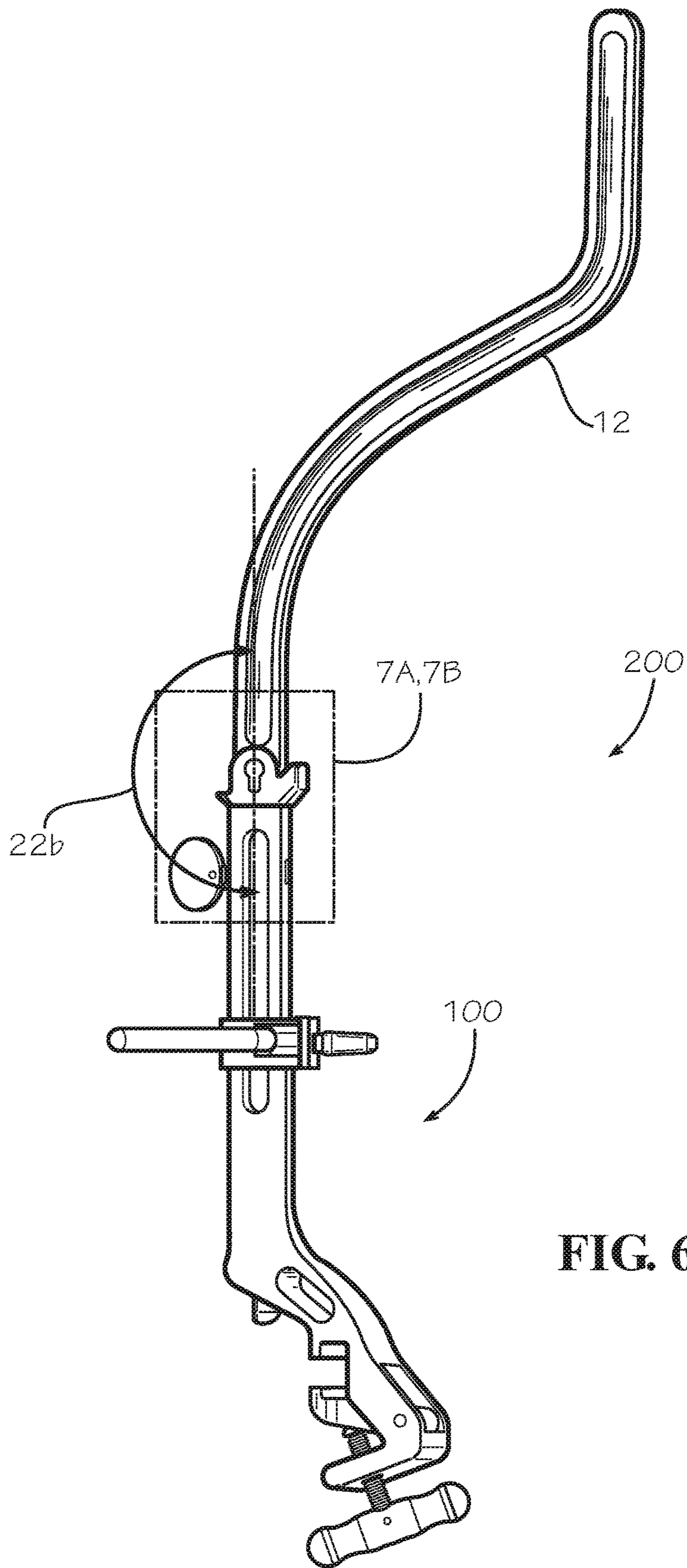


FIG. 6

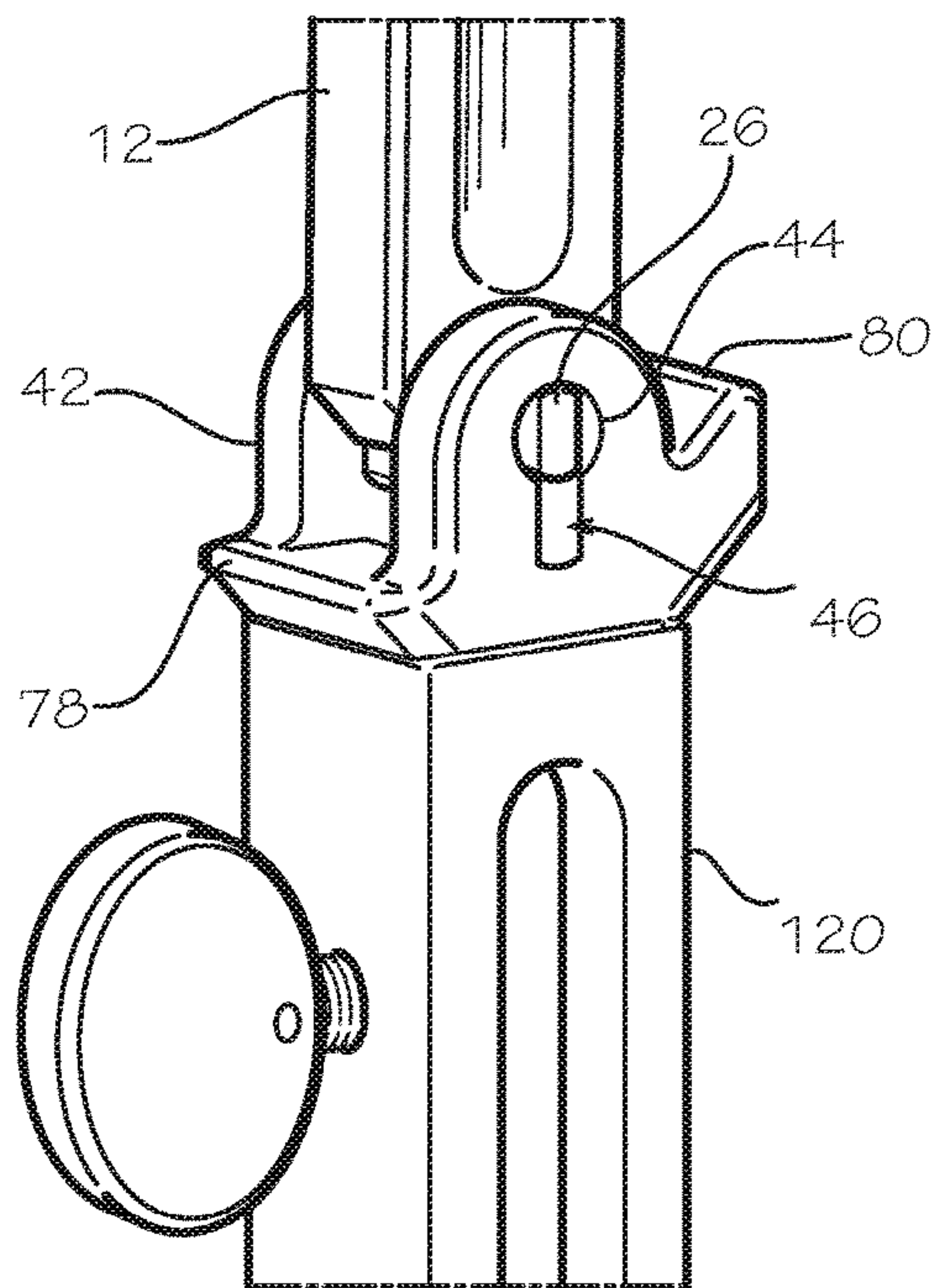


FIG. 7A

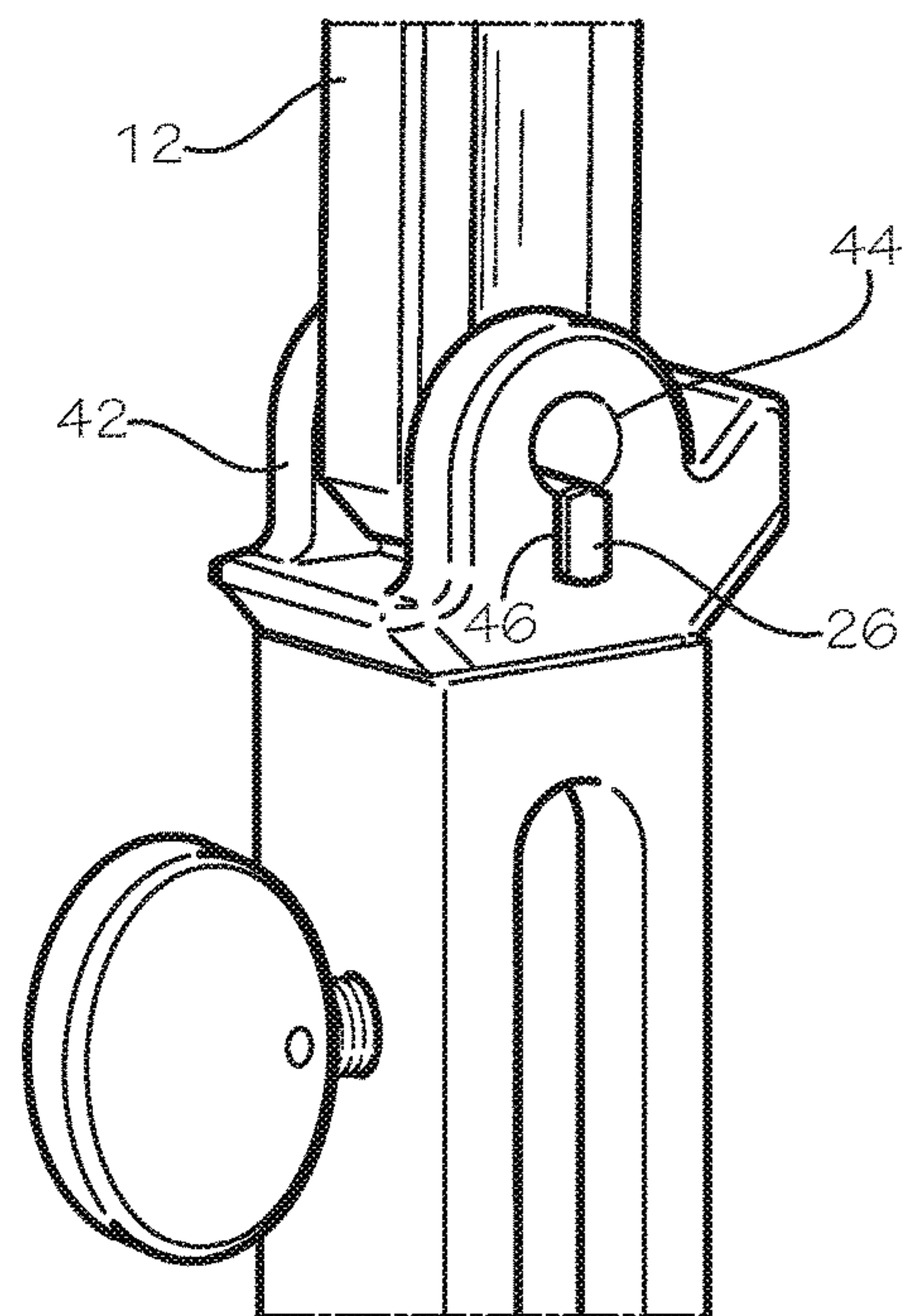


FIG. 7B

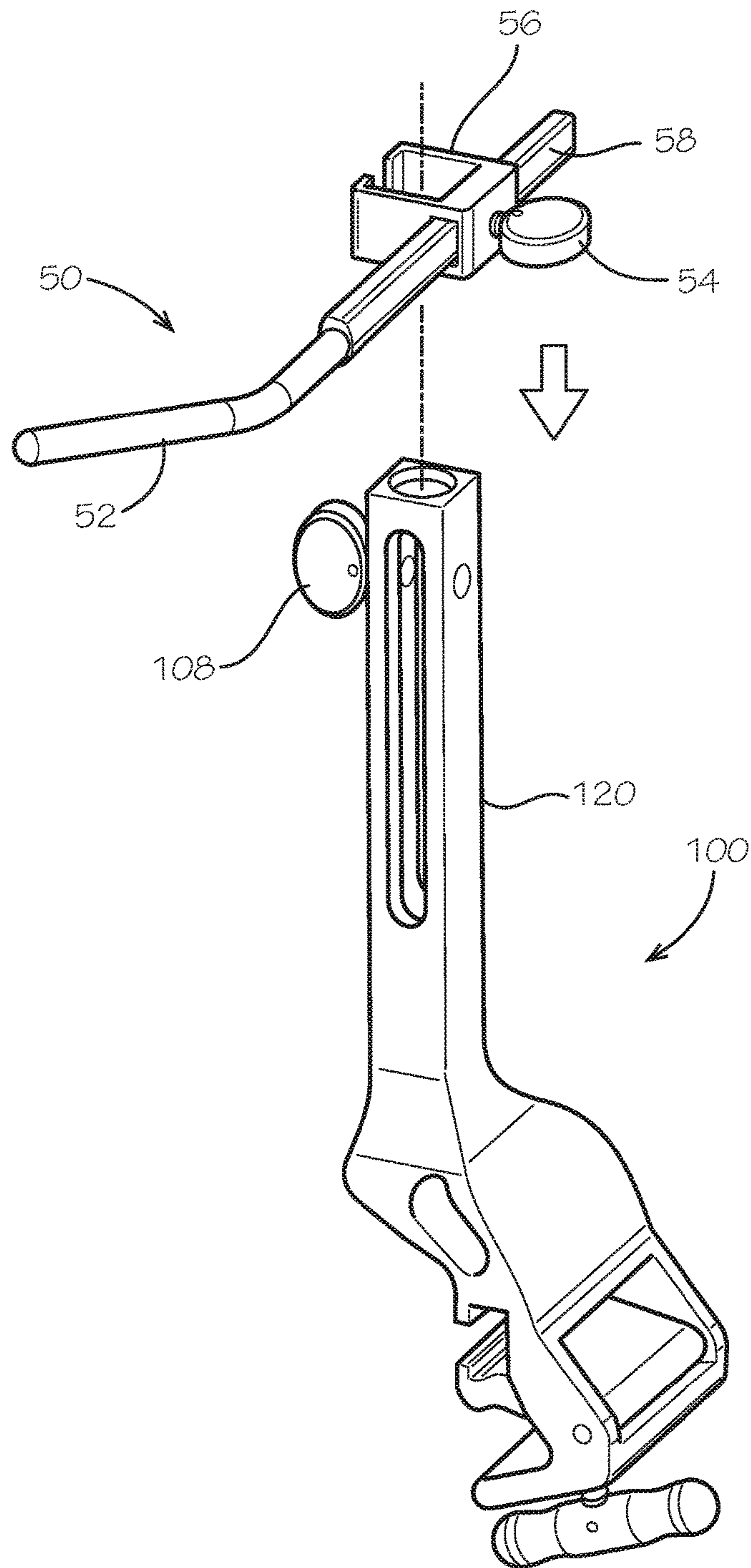


FIG. 8

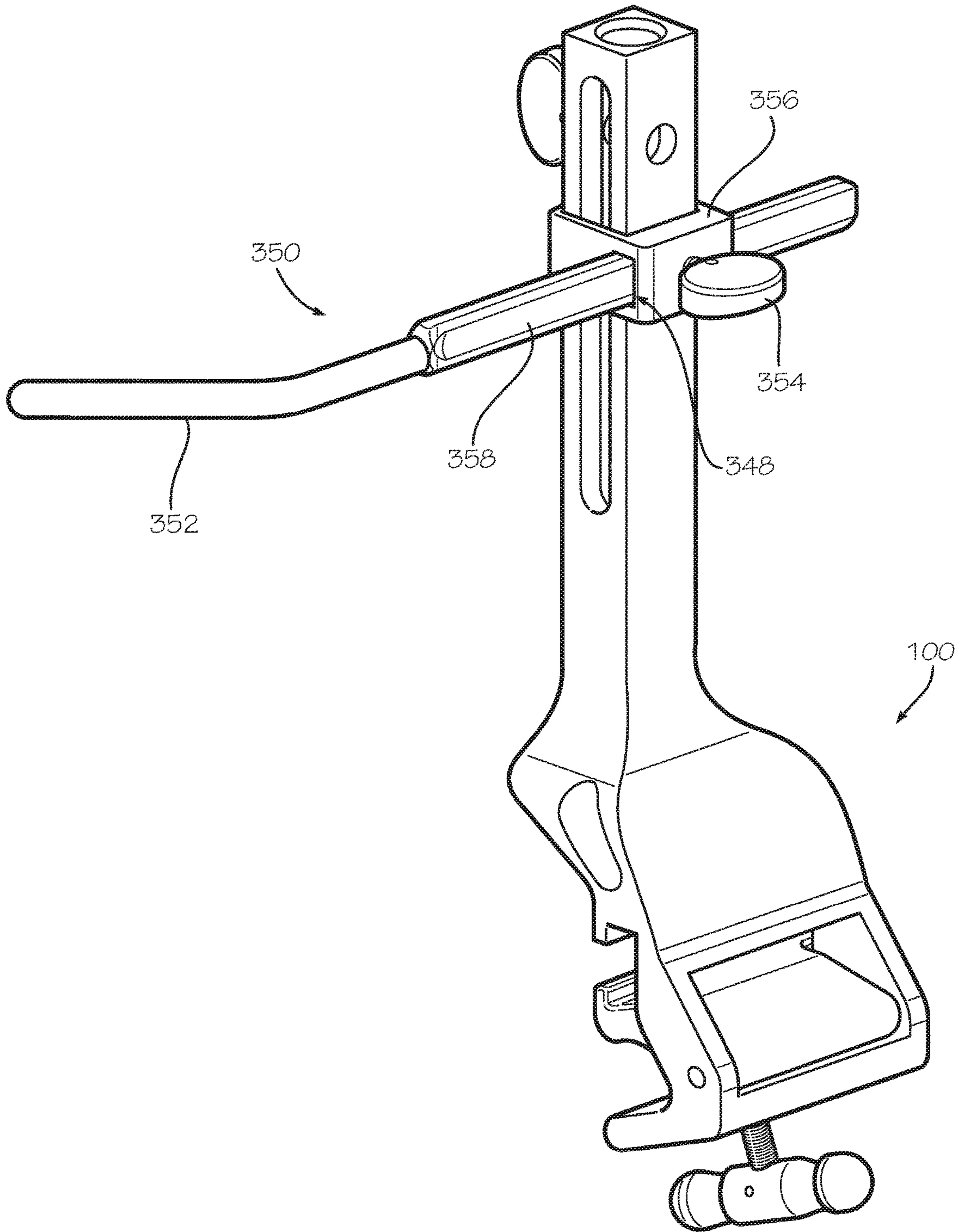


FIG. 9

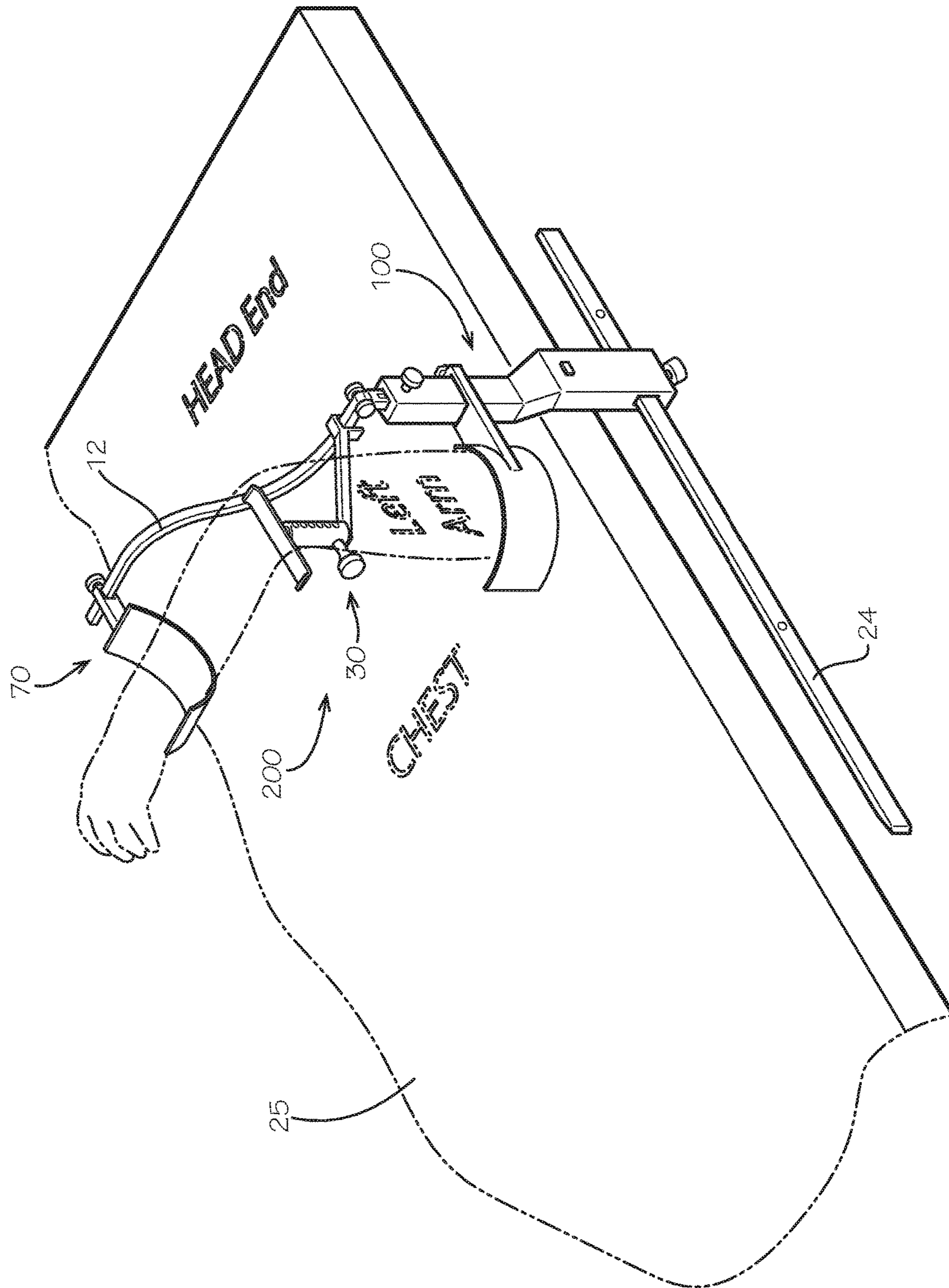


FIG. 10

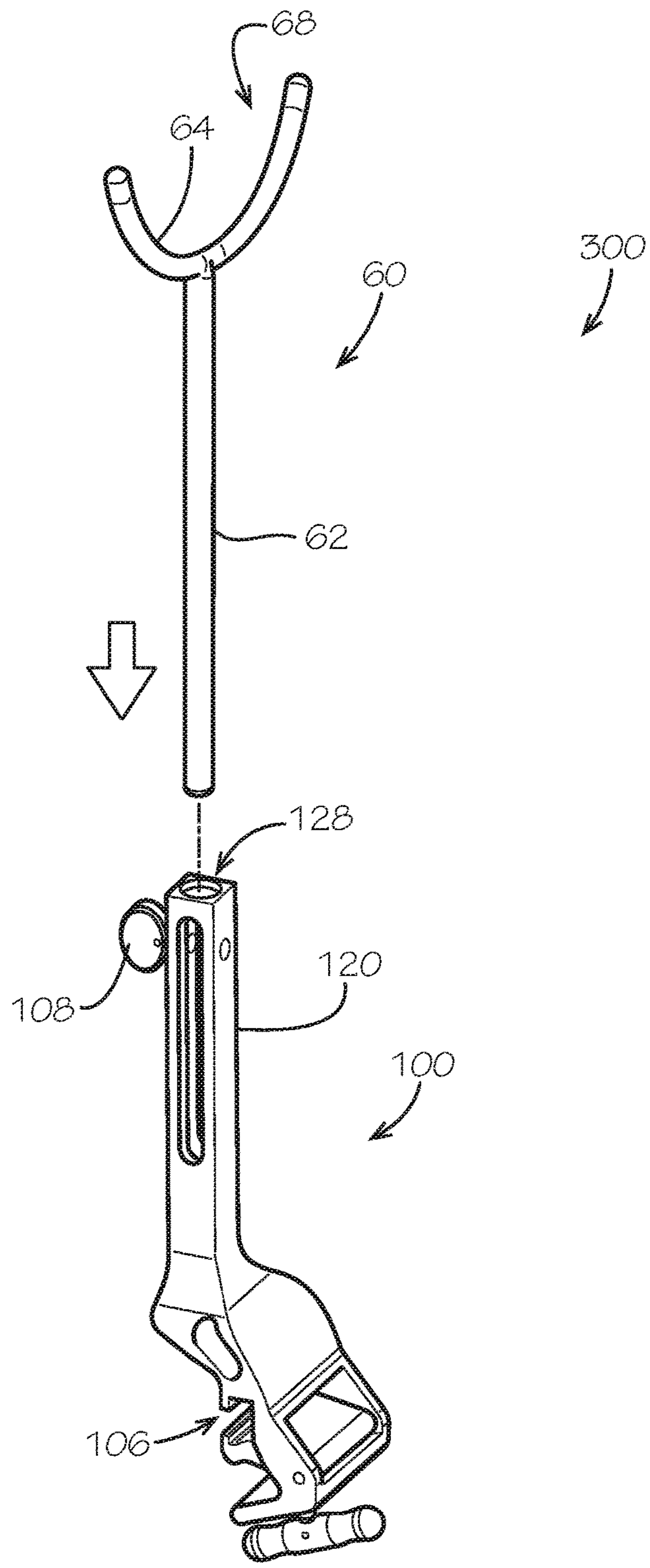


FIG. 11

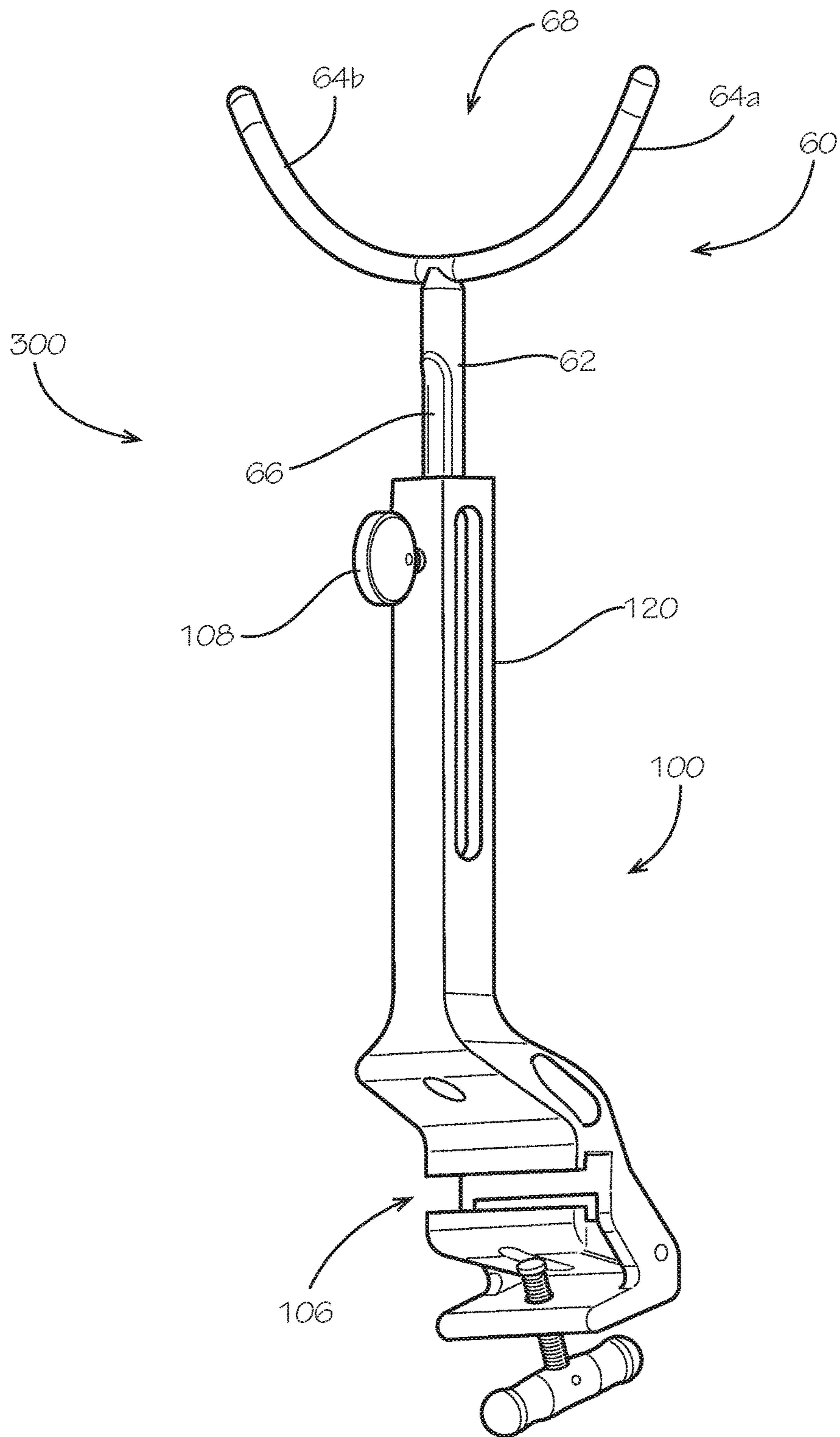


FIG. 12

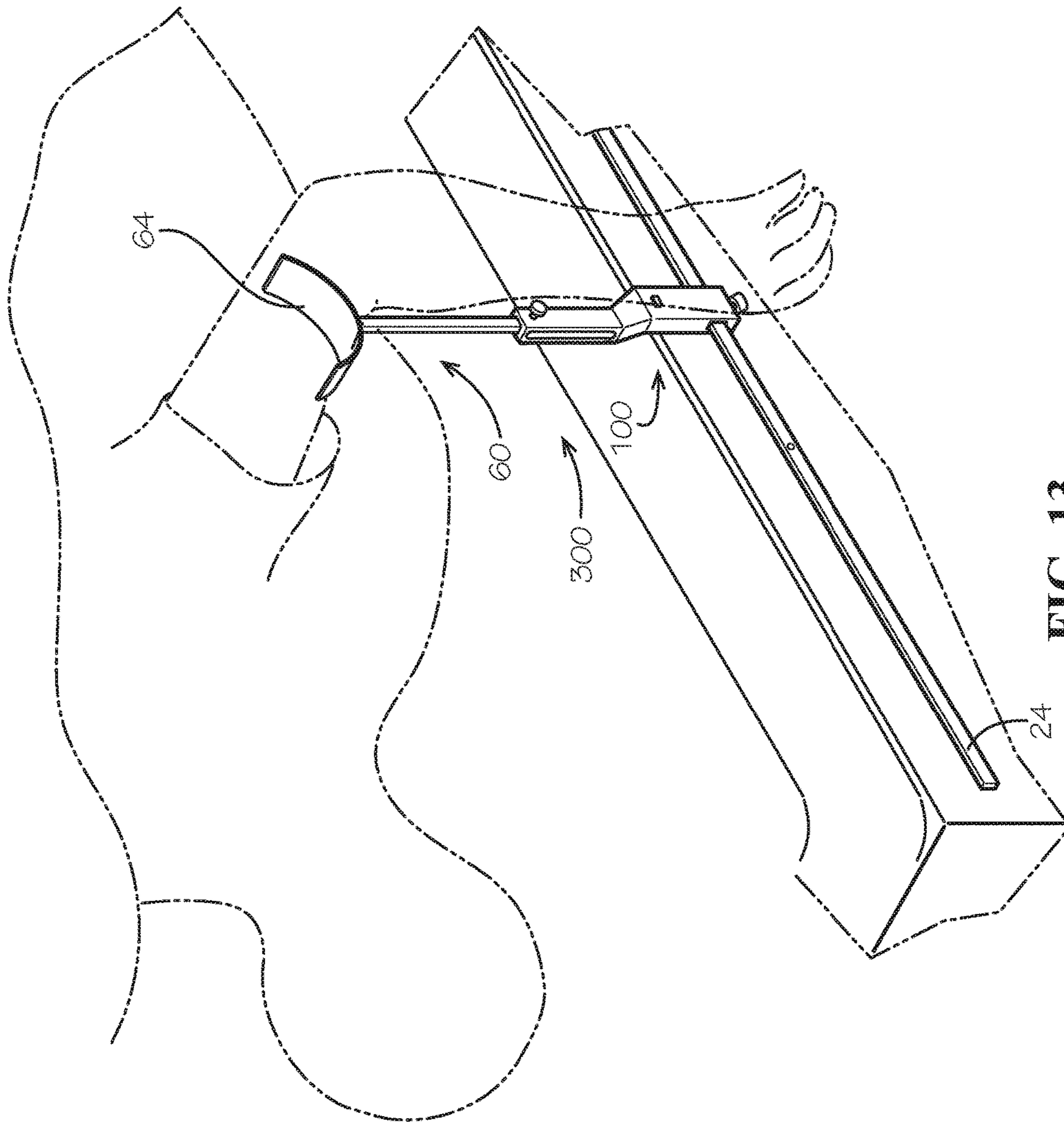


FIG. 13

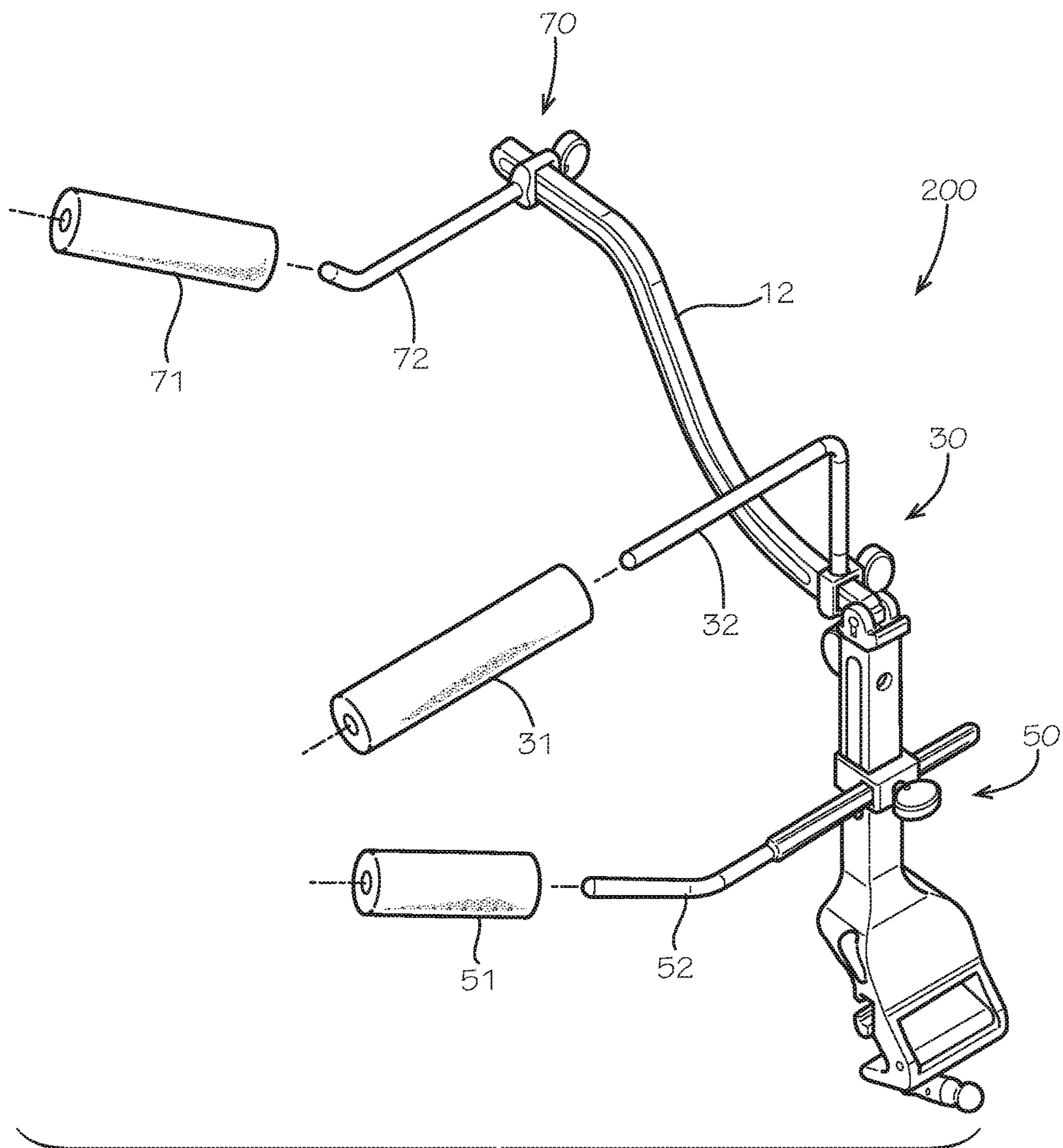


FIG. 14

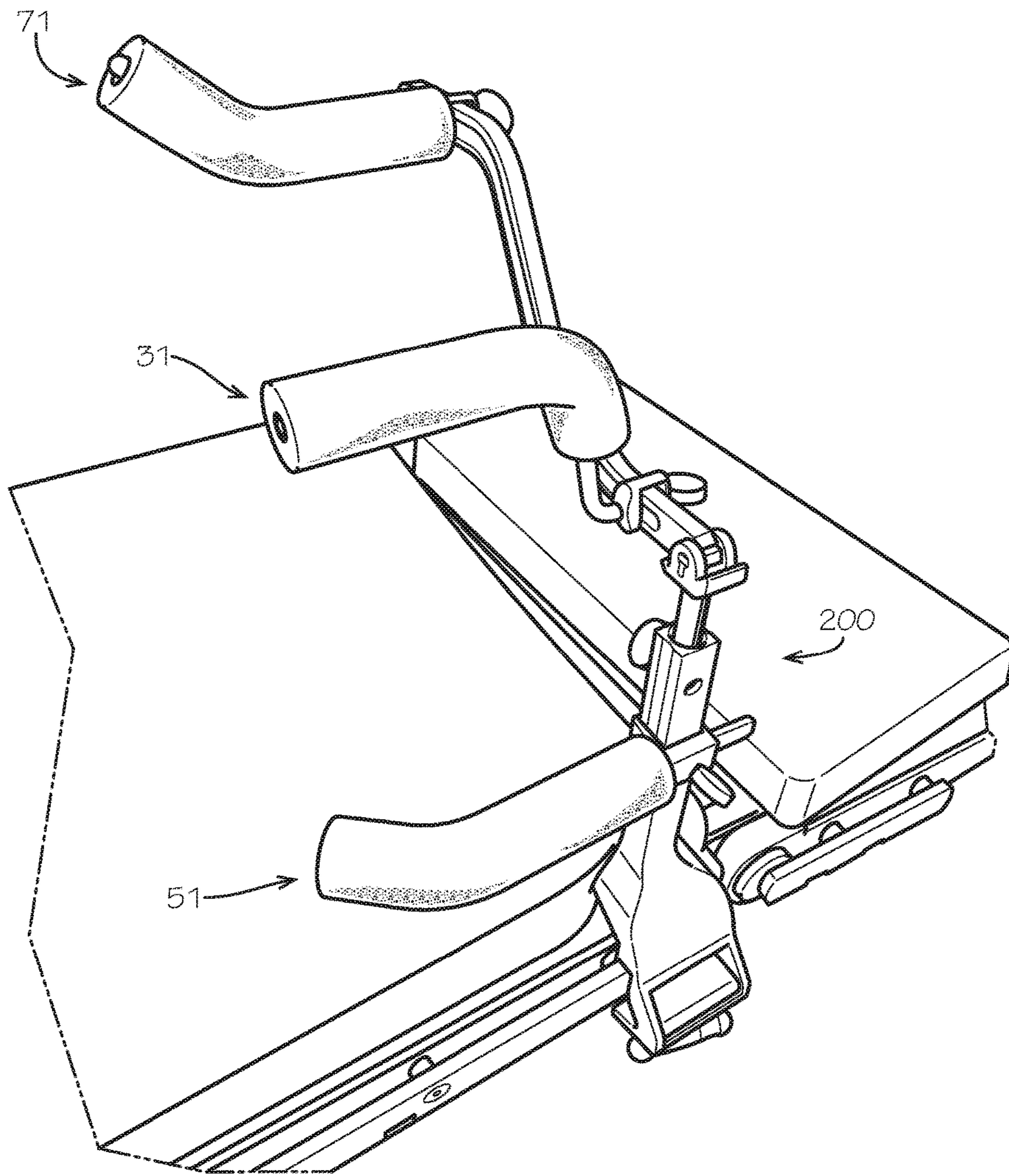


FIG. 15

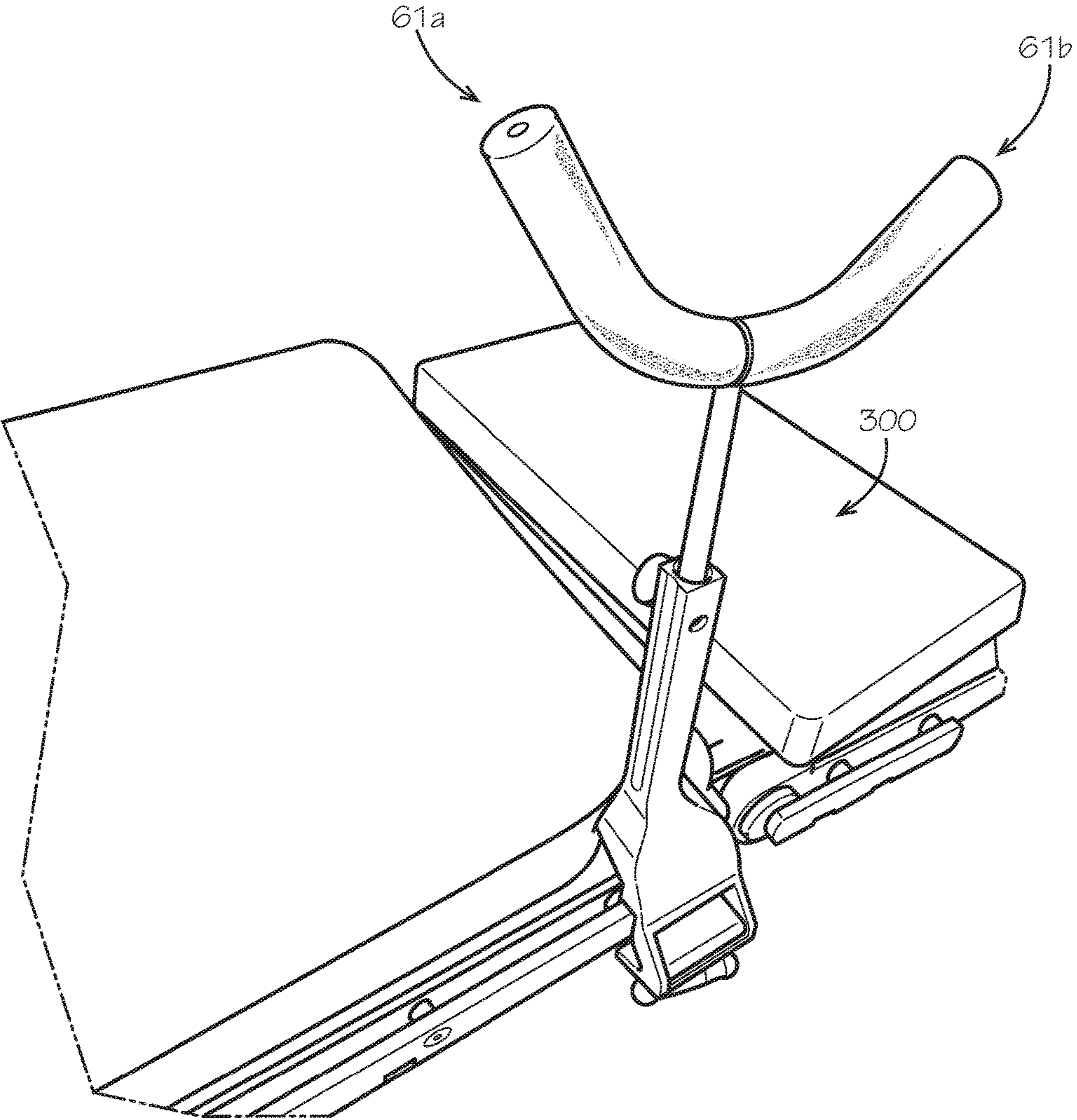


FIG. 16

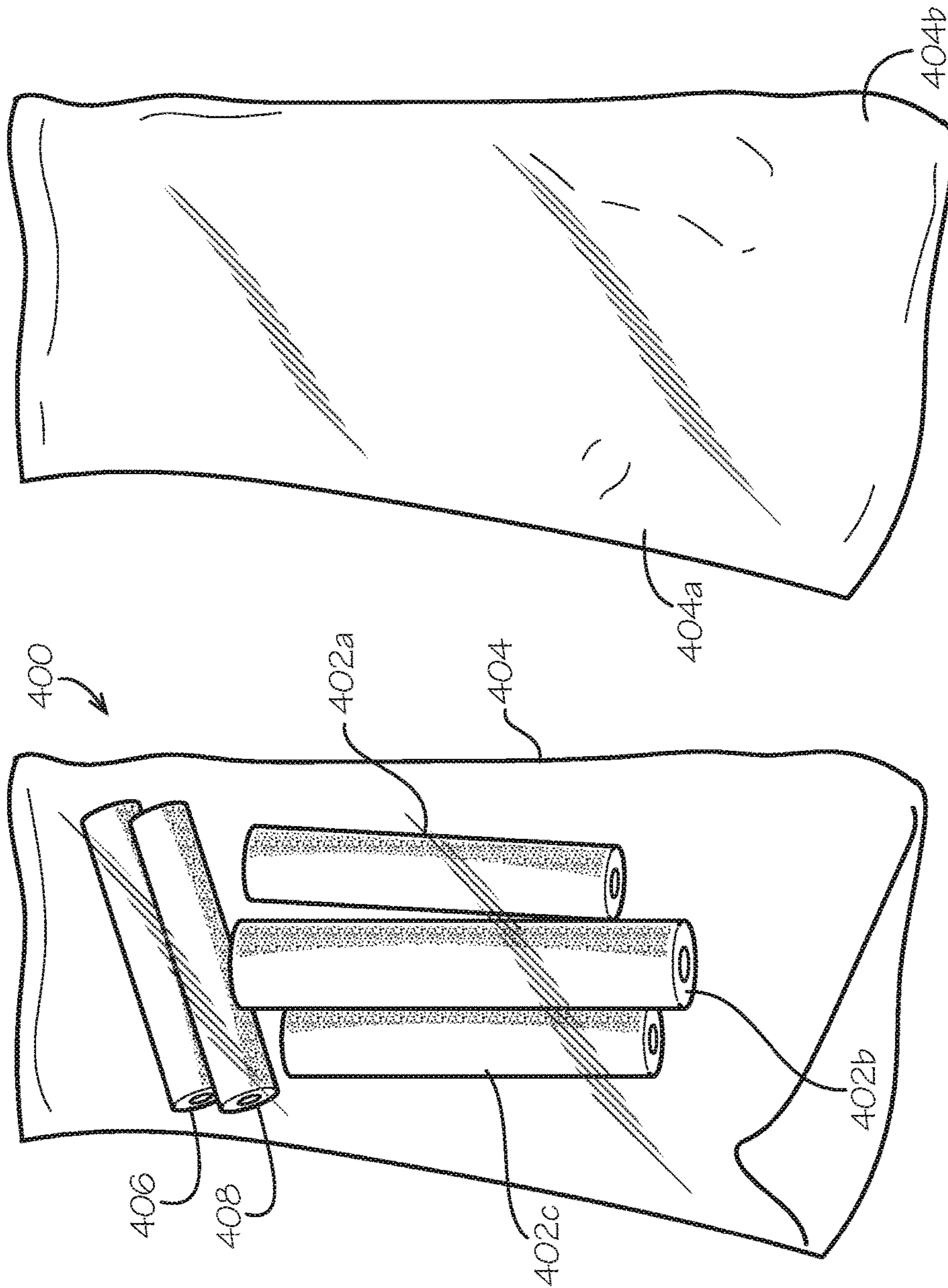


FIG. 17

FIG. 18

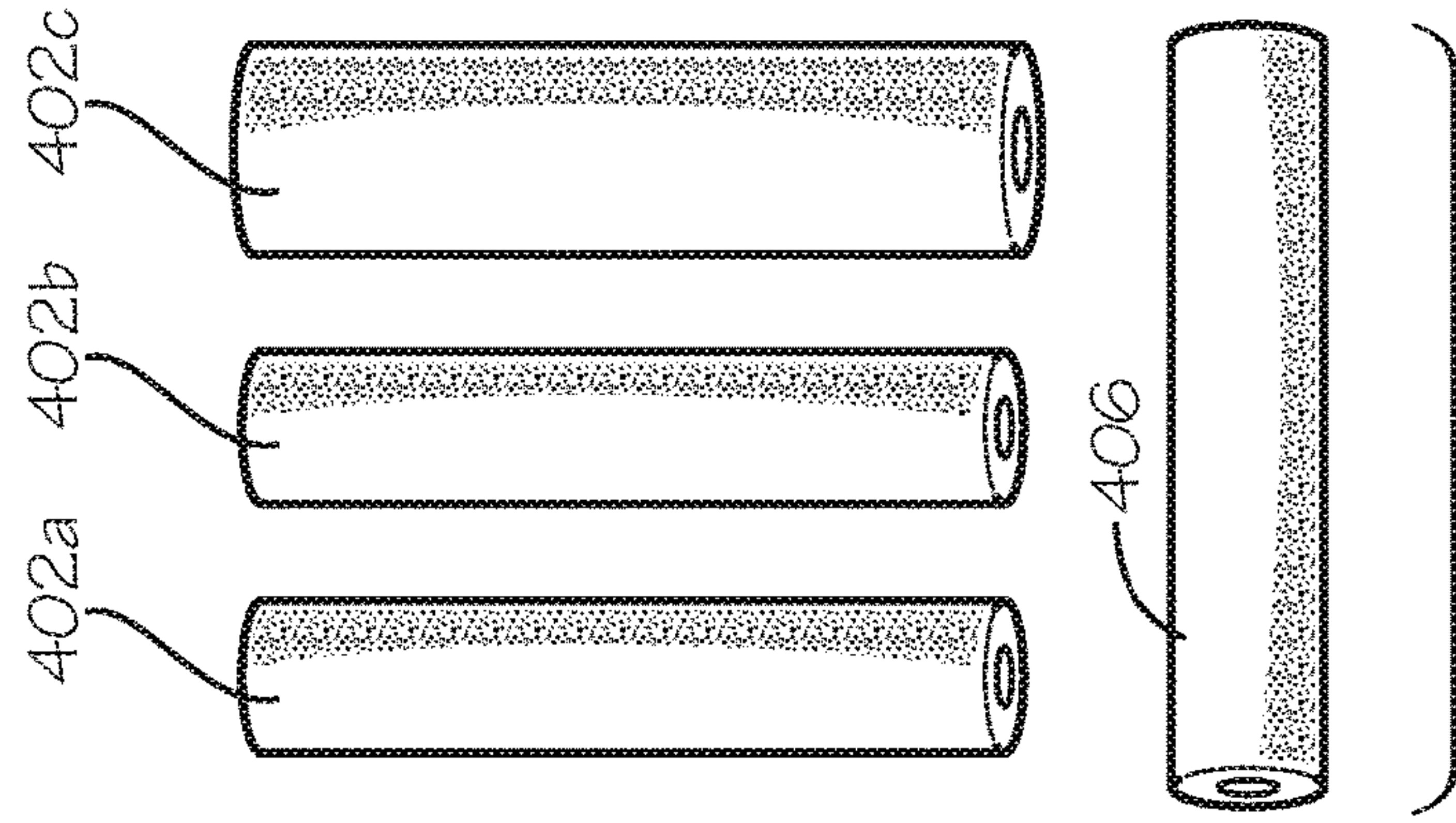


FIG. 19

ARM STABILIZER DEVICE AND METHODS**CROSS-REFERENCES TO RELATED APPLICATIONS**

This patent application is a continuation-in-part of and claims priority to the following references: co-pending U.S. patent application Ser. No. 13/717,352, filed Dec. 17, 2012 for Arm Stabilizer Device and Methods, which is a continuation of U.S. Pat. No. 8,356,601 issued Jan. 22, 2013 for Arm Stabilizer Device and Methods, which is a continuation-in-part of U.S. Pat. No. 8,230,864 issued Jul. 31, 2012 and entitled Arm Stabilizer for Elbow Surgical Procedure, all of which are incorporated by reference in their entireties.

BACKGROUND

The present invention relates generally to orthopedic positioning devices and more particularly to devices and methods for supporting an arm before, during or after a surgical, rehabilitative or imaging procedure.

Surgical procedures on the extremities of humans occur with great frequency, and particularly surgeries on the arm, elbow, and hand. Injuries to a person's arm, elbow and hand come frequently from falls, reaching to catch one's self, slipping or landing on an elbow causing a shattering or dislocation of the bone structure within the elbow, and attempting to brace oneself in response to a fall resulting in fractured bones in the humerus, elbow, forearm, and/or hand.

During the course of procedures to repair the broken bones or other features in the arm, historically, the patient's arm has been placed on a pillow or some other support structure resting on the patient's waist or chest, or a foam pad can be used to support the arm. This procedure fails to properly secure and maintain in a fixed position the extremity on which the procedure is being conducted. There have been numerous attempts to address this problem, including those described and illustrated in U.S. Pat. Nos. 473,200; 5,785,057; 7,017,215; 7,143,458; 7,441,293 and U.S. Publication No. 2008/0301878. The prior devices that are available in the industry, including those described in the afore-said patents are an improvement over the simple use of a pillow resting on the patient's chest, but remain inadequate. Specifically, conventional products fail to provide good exposure to the extremity, particularly to the patient's elbow, and make it difficult for the surgeon and assistants to have easy, unfettered access to the patient's elbow to properly complete the surgical, rehabilitative or imaging procedure. Additionally, conventional support devices do not allow vertical or longitudinal adjustment of a stabilizer bar and other modular attachments for the support device. Other support devices also generally do not allow interchangeability of different modular components for supporting different parts of the arm in different positions. Thus, there is a continuing need in the art for improvements in devices and methods for supporting an arm for such purposes.

BRIEF SUMMARY

The present invention generally provides devices and associated methods for stabilizing an arm during a surgical or rehabilitative procedure, during resting, during medical imaging of the arm, or during other times when it is desirable to have an arm stabilized in a stationary position.

In some embodiments, the present invention provides a rail clamp for attachment to a rail or other structure on a

patient table such as an operating or surgical table. One or more attachments can be detachably secured to the rail clamp. Each attachment is also included as a part of the invention.

5 In further embodiments, the present invention provides an arm positioner including a rail clamp configured to be secured to a rail on a patient table and an arm support securable to the rail clamp. The arm support includes a stabilizer bar and a base in some embodiments. The base is configured to secure to the rail clamp such that the stabilizer bar extends away from the rail clamp. One or more attachments can be detachably secured to the stabilizer bar. The base includes a rod that slides vertically into a corresponding socket in the rail clamp in some embodiments.

15 A humeral support attachment is also detachably secured to the rail clamp in some embodiments to further support a patient's humeral region during use. The humeral support attachment includes a humeral support mount that engages and secures to the rail clamp and a humeral support bar extending from the humeral support mount in a direction away from the rail clamp. The humeral support bar provides support to a patient's humeral region during use. One or more humeral support pads may be positioned on the humeral support bar to pad a patient's arm during use.

25 A reducer attachment is also detachably secured to the stabilizer bar in some embodiments. The reducer attachment includes a reducer mount that engages and secures to the stabilizer bar in some embodiments. A reducer support bar extends from the reducer attachment mount generally away from the stabilizer bar to provide a support for a patient's arm during use.

30 A wrist support attachment is also detachably secured to the stabilizer bar in some embodiments. The wrist support attachment includes a wrist support mount configured to engage and secure to the stabilizer bar. A wrist support bar extends from the wrist support mount in a direction generally away from the stabilizer bar. The wrist support bar is configured to support the wrist region of a patient's arm during use.

Each attachment is provided in a modular arrangement such that the overall arm positioner device may be used with one or more of the modular attachments.

35 In further embodiments, a lateral positioner device includes a rail clamp including a lateral brace installed on the rail clamp. The lateral positioner device includes a lateral support post configured to engage the rail clamp. A lateral brace is disposed on the lateral support post. In some embodiments, the lateral support post slides into a corresponding socket on the rail clamp to secure the post to the rail clamp. The lateral brace is interchangeable with the arm support on the rail clamp in some embodiments.

40 Numerous other objects, features and advantages of the present invention will be readily apparent to those skilled in the art upon a reading of the following disclosure when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

60 FIG. 1 illustrates a perspective view of an embodiment of a rail clamp in accordance with the present disclosure.

FIG. 2 illustrates a partially exploded perspective view of an embodiment of a rail clamp and arm support in accordance with the present disclosure.

65 FIG. 3 illustrates a perspective view of an embodiment of an arm positioner device in accordance with the present disclosure.

FIG. 4 illustrates a perspective view of an alternative embodiment of an arm positioner device in accordance with the present disclosure.

FIG. 5 illustrates a side elevation view of an embodiment of an arm positioner device with a support arm in a first angular position relative to the rail clamp in accordance with the present disclosure.

FIG. 6 illustrates a side elevation view of an alternative embodiment of an arm positioner device with a support arm in a second angular position relative to the rail clamp in accordance with the present disclosure.

FIG. 7A illustrates a detail perspective view of Section 7A of the embodiment of an arm positioner device from FIG. 6.

FIG. 7B illustrates a detail perspective view of Section 7B of the embodiment of an arm positioner device from FIG. 6.

FIG. 8 illustrates a partially exploded perspective view of an embodiment of a rail clamp and humeral support attachment in accordance with the present disclosure.

FIG. 9 illustrates a perspective view of the rail clamp and humeral support attachment of FIG. 8 in an assembled state in accordance with the present disclosure.

FIG. 10 illustrates a perspective view of an embodiment of an arm positioner arranged to support a patient's arm in a supine position on a patient table in accordance with the present disclosure.

FIG. 11 illustrates a partially exploded perspective view of an embodiment of a lateral positioner including a rail clamp and lateral brace in accordance with the present disclosure.

FIG. 12 illustrates a perspective view of the rail clamp and lateral positioner of FIG. 11 in an assembled state in accordance with the present disclosure.

FIG. 13 illustrates a perspective view of an embodiment of a lateral positioner device including a rail clamp and a lateral positioner arranged to support a patient's arm in a face down prone or lateral position on a patient table in accordance with the present disclosure.

FIG. 14 illustrates a partially exploded perspective view of an embodiment of an arm positioner and pad attachments in accordance with the present disclosure.

FIG. 15 illustrates a perspective view of an embodiment of an arm positioner with pad attachments installed in accordance with the present disclosure.

FIG. 16 illustrates a perspective view of an embodiment of a lateral positioner device with pad attachments installed in accordance with the present disclosure.

FIG. 17 illustrates a top view of an embodiment of a pad kit for use with an arm positioner or lateral positioner in accordance with the present disclosure.

FIG. 18 illustrates a top view of an enclosure for the pad kit of FIG. 17.

FIG. 19 illustrates a partial exploded view of the pad kit of FIG. 17.

DETAILED DESCRIPTION

Referring now to the drawings, FIG. 1 illustrates a perspective view of an embodiment of an arm stabilizer generally designated by the numeral 10. In the drawings, not all reference numbers are included in each drawing, for the sake of clarity. In addition, positional terms such as "upper," "lower," "side," "top," "bottom," "vertical," "horizontal" etc. refer to the apparatus when in the orientation shown in the drawings or similar orientations. A person of skill in the art will recognize that the apparatus can assume different orientations when in use.

Referring further to FIG. 1, an embodiment of a rail clamp 100 in accordance with the present disclosure is generally illustrated. Rail clamp 100 is generally configured for attachment to a side rail or other similar structure on a table such as an operating table or a surgical table. Similar types of rails may be found on other structures for supporting or transporting patients. Rails of this nature include a universal mounting configuration in some applications to allow for interchangeability of attachments. Rail clamp 100 includes a clamp base 112 having a clamp jaw 110, or pawl, that is hinged about a pawl axis 124 on the clamp base 112. A mounting recess 106 is defined between clamp base 112 and clamp jaw 110 shaped to receive the rail on which rail clamp 100 is to be mounted. A rail clamp fastener 104 allows clamp jaw 110 to be tightened against the rail. A handle is positioned on the rail clamp fastener 104 to allow for manual adjustment of the force applied to clamp jaw 110.

Rail clamp 100 may be positioned along the longitudinal length of a rail 24 by simply loosening the rail clamp fastener 104, repositioning the rail clamp 100, and then re-tightening the rail clamp fastener 104. This allows the rail clamp 100 to be moved relative to a patient's location on the table 25.

Rail clamp 100 is further configured to receive multiple modular attachments for use in supporting a patient's arm or other extremity during use. Rail clamp 100 includes a clamp body 120 protruding upwardly from the clamp base 112. Clamp body 120 includes a longitudinal section that is configured to extend generally upwardly away from the rail during use. A longitudinal socket 128 is defined in the rail clamp 100 in some embodiments. Socket 128 is shaped to receive a portion of a modular attachment in the socket.

As seen in FIG. 2, one type of modular attachment for installation on rail clamp 100 includes an arm stabilizer, or support arm 10. Support arm 10 includes a stabilizer bar 12 and a base 14. The stabilizer bar 12 is pivotally attached to the base 14 in some embodiments. In alternative embodiments, stabilizer bar 12 and base 14 include a rigid configuration on support arm 10. Base 14 includes a longitudinal shaft in some embodiments. The shaft on base 14 is shaped to be inserted longitudinally in socket 128 on rail clamp 100 in some embodiments. The shaft may form a rod having a round, oval or polygonal cross-sectional profile in various embodiments. The shaft of base 14 is dimensioned to fit in socket 128 on rail clamp 100. The shaft may be loaded into socket 128 in a generally vertical orientation after rail clamp 100 is secured to a rail on a table. Alternatively, the shaft of base 14 may be installed into the socket 128 on rail clamp 100 prior to attachment of rail clamp 100 to the rail on the operating table.

Base 14 is secured in place on rail clamp 100 using a socket fastener 108 in some embodiments. Socket fastener 108 includes a threaded fastener inserted in a transverse threaded bore in the clamp body 120 on rail clamp 100. Socket fastener 108 may be tightened against a portion of base 14 housed in socket 128 to secure the base 14 in place, as seen in FIG. 3. Base 14 is longitudinally adjustable relative to rail clamp 100 in some embodiments, as seen in FIG. 4. Socket fastener 108 may be loosened, and base 14 may be slid up or down to accommodate patients of different sizes. When a proper position is reached, socket fastener 108 is re-tightened to hold the base 14 in place. The ability to load and unload base 14 into or away from rail clamp 100 in a longitudinal orientation provides an advantage over other loading configurations in some applications because a longitudinal configuration allows displacement of the base

14 substantially parallel to a patient's humeral region without causing the stabilizer bar **12** to laterally interfere with the patient's arm.

Referring further to FIGS. **1-4**, rail clamp **100** also includes a clamp groove **102** in some embodiments. Clamp groove **102** generally includes a recess defined on the clamp body **120** forming a channel for attachment of one or more modular components. Clamp groove **102** includes a blind recess in some configurations forming a slight channel for receiving a corresponding structure. The clamp groove **102** allows a modular attachment to be slid along the length of the groove for positioning of the attachment. Alternatively, clamp groove **102** provides a clearance groove that is open to the socket **128** such that the portion of base **14** extending into socket **128** is visible through the clearance in the clamp groove **102**. In such configurations, a user may be able to visually inspect the location of base **14** in socket **128**. This allows a user to ensure the base is sufficiently installed a proper depth into socket **128** to provide adequate support. If base **14** does not extend far enough into socket **128**, support arm **10** may inadvertently become loosened from the rail clamp **100** and allow undesirable motion during use. By providing a clamp groove **102** having a clearance section, it is possible to visually verify the base **14** is located at a proper position in the socket **128**. Accordingly, in some embodiments, base **14** has indicia at a predetermined location such that a user may visually inspect the location of base **14** relative to socket **128**.

Clamp body **120** provides a mounting location for one or more modular attachments. As seen in FIGS. **2-4** and FIGS. **8-9**, a humeral support attachment **50** is mounted on rail clamp **100** in some embodiments. More specifically, humeral support attachment **50** includes humeral support mount **56** shaped to be installed on rail clamp **100**. Humeral support mount **56** may be slid onto clamp body **120** as shown in FIGS. **8-9**. A humeral mount fastener **54** is positioned on humeral support mount **56** to secure humeral support attachment **50** at a desired location on rail clamp **100**. Humeral mount fastener **54** includes a threaded fastener extending through a corresponding threaded hole in humeral support mount **56**. The humeral support mount **56** may be slid up or down along the longitudinal length of clamp body **120** on rail clamp **100** and secured at a desired location using humeral mount fastener **54**.

A humeral support arm **52** protrudes from humeral support mount **56** in some embodiments. Humeral support arm **52** extends generally transverse to the longitudinal orientation of rail clamp **100** in some applications. Humeral support arm **52** includes a slide **58** disposed through a humeral mount opening **48** in humeral support mount **56** in some embodiments. Slide **58** is moveable through humeral mount opening **48** to allow the humeral support arm **52** to be selectively repositioned relative to the rail clamp **100**. As such, a user may modify the distance the humeral support arm **52** extends from rail clamp **100**. This may be advantageous when configuring the device to support patients of different sizes.

As seen in FIG. **4**, in some embodiments, humeral support arm includes a first humeral support arm section **52a** and a second humeral support arm section **52b** separated at a humeral support arm bend **53**. The first and second humeral support arm sections are angled at a generally obtuse angle. In some embodiments, this angle is between about 180 degrees and about 140 degrees. The slight angle between these sections provides improved support of the humeral section of the patient's arm during use.

In some embodiments, humeral mount fastener **54** secures the humeral support arm **52** in place by applying force against the slide region **58** of humeral support arm **52** and also secures the humeral support mount **56** in place relative to the rail clamp **100**. As seen in FIG. **9**, tightening the humeral mount fastener **54** applies force against the slide region **58** on the humeral support arm **52**. The applied force presses the other side of the slide region **58** against the surface of the clamp body **120** on the rail clamp **100**, thereby securing both the humeral support arm **52** and the humeral support mount **56** in place relative to the rail clamp **100**. In some embodiments, the present invention provides a humeral support attachment including a humeral support arm that is moveable in two axes relative to the rail clamp. Specifically, the humeral support arm is vertically moveable along the longitudinal direction of the clamp body and is also moveable transverse to the clamp body in the longitudinal direction of the humeral support arm. This provides an advantage over conventional humeral support devices that may be fixed in place relative to the rail clamp or otherwise limited to adjustment along only one axis.

Referring further to FIGS. **2-4**, in further embodiments one or more modular attachments may be secured to the stabilizer bar **12** on support arm **10** to form arm positioner device **200**. Stabilizer bar **12** includes a longitudinal bar having a proximal bar end **18** located near base **14** and a distal bar end **20** extending away from base **14**. One or more modular attachments may be secured to the stabilizer bar **12** between the proximal and distal bar ends. For example, a wrist support attachment **70** is secured to the stabilizer bar **12** on support arm **10** in some embodiments. Wrist support attachment **70** provides a structure for supporting a wrist, forearm or hand region on a patient during use. Wrist support attachment includes a wrist support mount **76** and a wrist support bar **72** protruding from the wrist support mount **76** in a direction away from the stabilizer bar **12**. Wrist support mount **76** engages the stabilizer bar **12** and includes a wrist support fastener **74** for securing the wrist support attachment **70** to the stabilizer bar **12** in some embodiments. Wrist support fastener **74** includes a threaded fastener in some embodiments. Wrist support fastener **74** applies a force against the side of the stabilizer bar **12** to secure the wrist support attachment **70** in place. Wrist support attachment **70** may be repositioned along the length of the stabilizer bar **12** by loosening the wrist support fastener **74**, repositioning the wrist support mount **76** to a desired location along the length of stabilizer bar **12**, and then retightening wrist support fastener **74**. The ability to reposition the wrist support attachment **70** relative to the stabilizer bar **12** provides an advantage over other supports that are fixed in place.

As seen in FIG. **4**, in some embodiments, wrist support bar **72** includes an angled end to further support a patient's wrist, hand or forearm and to keep the patient's extremity from inadvertently sliding off the end of the wrist support bar **72**. Additionally, a mounting groove may be defined in the stabilizer bar **12** along the length of the stabilizer bar **12**. One or more structures on the wrist support mount **76** extend at least partially into the mounting groove on the stabilizer bar **12**. As such, the mounting groove in the stabilizer bar operates as a track along which the wrist support mount **76**, or any other modular attachment, may slide during adjustment of the attachment.

Referring further to FIGS. **3-4**, another type of attachment known as a reducer attachment **30** may be positioned on the stabilizer bar **12**. Reducer attachment **30** provides structural support for a patient's humeral region, elbow, or forearm

during use. In some applications, a reducer support arm **32** extends from a reducer mount **34** on the reducer attachment. Reducer support arm **32** may be located near a patient's elbow joint, as seen in FIG. **10**, when a patient is lying in a supine position on an operating table. The reducer support arm **32** supports an underside portion of a patient's arm and provides a reaction structure against which a physician may apply force during an operation on the patient's arm or elbow.

Referring further to FIG. **4**, reducer attachment **30** includes a generally L-shaped reducer support arm **32** in some embodiments including a first reducer support arm section **32a** and a second reducer support arm section **32b** oriented at an angle relative to the first reducer support arm section **32a**. These two sections join at a reducer attachment bend **33** and form a substantially right angle in some embodiments. The second reducer support arm section **32b** extends away from the stabilizer bar **12** and provides support to the user's arm.

The reducer attachment **30** includes a reducer mount **34** that engages the stabilizer bar **12**. A reducer fastener **36** on the reducer mount **34** provides a force against the stabilizer bar **12** to secure the reducer attachment **30** in position. Reducer fastener **36** includes any suitable fastener such as a threaded fastener for applying force against the stabilizer bar **12**. A user may adjust the position of the reducer attachment **30** on the stabilizer bar **12** by loosening the reducer fastener **36**, repositioning the reducer attachment at a desired location along the length of the stabilizer bar **12**, and then retightening the reducer fastener **36**. In some embodiments, the reducer fastener **36** engages a mounting groove on the stabilizer bar **12**, where the mounting groove operates as a track along which the reducer mount **34** may be slid for positioning the reducer attachment **30**.

The reducer attachment **30** may be used on the arm positioner device **200** as the only modular attachment. For example, in some embodiments, the arm positioner device **200** includes only the rail clamp **100**, the support arm **10** and the reducer attachment **30**. In other embodiments, arm positioner device **200** includes only the rail clamp **100**, and humeral support attachment **50**, as seen in FIGS. **8-9**. In further embodiments, the arm positioner device **200** includes only the rail clamp **100**, support arm **10**, humeral support attachment **50**, and wrist support attachment **70**. In additional embodiments, the arm positioner device **200** includes only the rail clamp **100**, support arm **10**, and wrist support attachment **70**. In further embodiments, the arm positioner device **200** includes only the rail clamp **100**, support arm **10**, wrist support attachment **70**, and reducer attachment **30**. In yet other embodiments, the arm positioner device **200** includes the rail clamp **100**, support arm **10**, wrist support attachment **70**, humeral support attachment **50** and reducer attachment **30**.

Referring further to FIGS. **5-7B**, in some embodiments the stabilizer bar **12** is angularly moveable relative to the base **14**. As such, stabilizer bar **12** is also angularly moveable relative to rail clamp **100** when base **14** is installed on the rail clamp. As seen in FIG. **5**, stabilizer bar **12** may be oriented relative to rail clamp **100** at a first angle **22a**. The first angle may be approximately ninety degrees in some embodiments. A first angle stop **78**, shown in FIG. **7A**, on support arm **10** provides an angular stop for stabilizer bar **12**. Stabilizer bar **12** is attached to base **14** at a base hinge **16** in some embodiments. Stabilizer bar **12** may be angularly rotated back as shown in FIG. **6** to a second angle greater than ninety degrees.

In some embodiments, support arm **10** includes an angular lock to secure stabilizer bar **12** at a desired angle. For example, as seen in FIGS. **7A** and **7B**, a base head **42** is positioned on base **14** in some embodiments. Base head **42** includes a pivot opening **44**. A locking pin **26** attached to stabilizer bar **12** extends transversely through and is rotatable in pivot opening **44**. A locking slot **46** adjoins and is open to pivot opening **44**. Locking pin **26** includes a substantially flat dimension shaped to be received in locking slot **46**. Locking pin **26** may slide locking slot **46**, as seen in FIG. **7B**, when stabilizer arm **12** is positioned at a corresponding angular position. In some applications, the angular lock is configured to selectively lock stabilizer bar **12** in a substantially vertical configuration, as seen in FIG. **6**. When a user desires to unlock the angular lock, the stabilizer bar **12** may simply be lifted up to disengage locking pin **26** from locking slot **46**, thereby allowing free rotation of locking pin **26** in pivot opening **44**.

In some applications, it is desirable to provide a back angular stop on support arm **10** such that stabilizer bar **12** does not rotate too far away from the patient during use. As such, a second angular stop **80** is positioned on base head **42** in some embodiments. Second angular stop allows support arm **10** to be rotated away from a patient when not in use.

Referring further to FIGS. **11-13**, additional embodiments of the present invention provide a lateral positioner device that may be used to support a patient's arm in a face down or prone position or in a lateral position. An advantageous feature of the present invention is the ability to use the rail clamp **100** interchangeably with either an arm positioner device **200**, as shown in FIGS. **2-6** and with a lateral positioner device **300**, as shown in FIGS. **11-13**. Lateral positioner device **300** includes a rail clamp **100** as described above. A lateral brace **60** is securable to the rail clamp **100** to provide support to a patient's arm in a prone position, as seen in FIG. **13**, or in a lateral position. Lateral brace **60** includes a longitudinal post **62** shaped to be inserted longitudinally in socket **128** on rail clamp **100**. Lateral support arms **64** extend from post **62** at a T-shaped junction in some embodiments. First and second lateral support arms **64a**, **64b** intersect at post **62** and generally extend away from post **62** at an upward angle, as seen in FIG. **12**. A brace recess **68** is defined between first and second lateral support arms **64a**, **64b**. A patient's arm is located in the brace recess **68** during an operation. Lateral brace **60** may support a patient's humeral region along the bicep or may engage the patient at or near the elbow joint.

In some embodiments, lateral brace **60** has an adjustable height such that the brace may be repositioned relative to rail clamp **100**. For example, as seen in FIG. **12**, post **62** is longitudinally adjustable in socket **128** on rail clamp **100**. Socket fastener **108** may be tightened against post **62** to secure lateral brace **60** at a desired height. To adjust the height of lateral brace **60**, a user may loosen socket fastener **108**, reposition post **62**, and then retighten socket fastener **108**. In some embodiments, post **62** includes a substantially flat surface **66** to provide enhanced application of force from socket fastener **108**. Additionally, in some embodiments, flat surface **66** prevents inadvertent rotation of post **62** when engaged by socket fastener **108**.

Referring further to FIGS. **14-16**, various pad attachments may be positioned on each modular attachment to provide a padded interface between the attachment and a user's arm. For example, as seen in FIG. **14**, humeral support attachment **50** includes a humeral support arm **52**. A humeral support pad **51** includes an elongated pad having a hollow interior aperture shaped to receive the humeral support arm **52**. In

some embodiments, humeral support pad **51** includes a generally cylindrical hollow tubular shape. As such, the humeral support pad **51** may be slid directly onto the humeral support arm **52**, as seen in FIG. **15**. Humeral support pad **51** includes pad material such as but not limited to an open-cell or closed-cell foam material, foam rubber, polyethylene padding, latex padding, EVA padding, or any other suitable padding material. Humeral support pad **51** includes a disposable pad that may be discarded after use in some applications.

Referring further to FIG. **14**, reducer attachment **30** includes a reducer support arm **32**. A reducer support pad **31** includes an elongated pad having a hollow interior aperture shaped to receive the reducer support arm **32**. In some embodiments, reducer support pad **31** includes a generally cylindrical hollow tubular shape. As such, the reducer support pad **31** may be slid directly onto the reducer support arm **32**, as seen in FIG. **15**. Reducer support pad **31** includes pad material such as but not limited to an open-cell or closed-cell foam material, foam rubber, polyethylene padding, latex padding, EVA padding, or any other suitable padding material. Reducer support pad **31** includes a disposable pad that may be discarded after use in some applications.

Referring further to FIG. **14**, wrist support attachment **70** includes a wrist support arm **72**. A wrist support pad **71** includes an elongated pad having a hollow interior aperture shaped to receive the wrist support arm **72**. In some embodiments, wrist support pad **71** includes a generally cylindrical hollow tubular shape. As such, the wrist support pad **71** may be slid directly onto the wrist support arm **72**, as seen in FIG. **15**. Wrist support pad **71** includes pad material such as but not limited to an open-cell or closed-cell foam material, foam rubber, polyethylene padding, latex padding, EVA padding, or any other suitable padding material. Wrist support pad **51** includes a disposable pad that may be discarded after use in some applications.

Referring further to FIG. **12** and FIG. **16**, lateral positioner device **300** may also include one or more pads on first and second lateral support arms **64a**, **64b**. For example, a first lateral support arm pad **61a** is positioned on first lateral support arm **64a**, and a second lateral support arm pad **61b** is positioned on second lateral support arm **64b**. Each lateral support arm pad **61a**, **61b** includes an elongated pad having a hollow interior aperture shaped to receive its corresponding lateral support arm. In some embodiments, each lateral support arm pad includes a generally cylindrical shape. Each lateral support arm pad may be slid directly onto its corresponding lateral support arm, as seen in FIG. **16**. Each lateral support arm pad includes pad material such as but not limited to an open-cell or closed-cell foam material, foam rubber, polyethylene padding, latex padding, EVA padding, or any other suitable padding material. Each lateral support arm pad includes a disposable pad that may be discarded after use in some applications.

Referring further to FIGS. **17-19**, a pad kit apparatus **400** is provided in some embodiments. Pad kit apparatus **400** includes a package including first, second and third pads **402a**, **402b**, **402c** housed within a sealed enclosure **404**. Enclosure **404** provides a sealed, sterile package for first, second and third pads. A user may open enclosure **404** to access the pads. First and second straps **406**, **408** are included in the package in some embodiments. Each strap includes a hook-and-loop fabric in some embodiments to provide a fastener for securing a portion of a patient's body to one of the first, second and third pads. Each strap is

dimensioned to extend around a patient's arm, hand or wrist and also around one of the first, second and third pads in some embodiments.

In some embodiments, each of the first, second and third pads include substantially identical dimensions. As such, each pad is generally interchangeable and may be used as a humeral support pad **51**, a reducer support pad **31**, a wrist support pad **71**, or a lateral support arm pad **61**. In some embodiments, each pad includes an axial length between about ten centimeters and about thirty centimeters. In further embodiments, each pad includes an axial length of about twenty centimeters. Each pad also includes an outer diameter of between about two and about six centimeters in some embodiments. In further embodiments, each pad includes an outer diameter of about four centimeters. Additionally, each pad includes an axial passage defined through the axial length of the pad. The axial passage is dimensioned to receive one or more support bars such as wrist support bar **72**, humeral support bar **52** or reducer support bar **32**. In some embodiments, each axial passage includes an inner diameter of between about 0.5 centimeters and about 1.5 centimeters. In further embodiments, the axial passage in each pad includes an inner diameter of about 1.1 centimeters. In some embodiments, the axial passage in each pad includes an inner diameter equal to or less than the outer diameters of the wrist support bar **72**, humeral support bar **52**, and reducer support bar **32** to provide a closer or interference fit.

The pad kit apparatus **400** may be provided as an accessory package for use with an arm positioner device or lateral positioner device in accordance with the present disclosure. The pad kit apparatus **400** is entirely disposable after use in some embodiments. Each pad in the pad kit apparatus **400** is configured for use specifically on one of the wrist support bar **72**, humeral support bar **52**, reducer support bar **32**, or lateral support bar.

As seen in FIG. **18**, package **404** includes two sheets joined together around the perimeter to form an enclosure for the first, second and third pads and first and second straps. The top sheet **404a** includes a transparent material in some embodiments. The backing sheet **404b** includes a reinforced paper or polymer backing in some embodiments.

Thus, although there have been described particular embodiments of the present invention of a new and useful Arm Stabilizer Device and Methods, it is not intended that such references be construed as limitations upon the scope of this invention except as set forth in the following claims.

What is claimed is:

1. An arm positioning apparatus for mounting on a universal rail of an operating table and for supporting a patient's arm when the patient is lying in a supine position on the table, the apparatus comprising:

- a rail clamp configured for attachment to the rail, the rail clamp including a clamp base and a clamp body protruding upwardly from the clamp base, the clamp body including a longitudinal section configured to extend away from the rail during use;
- a humeral support mount disposed on the clamp body of the rail clamp, wherein the humeral support mount is moveable longitudinally along the clamp body on the rail clamp and the humeral support mount is configured to accept at least one attachment;
- a humeral support fastener disposed on the humeral support mount, the humeral support fastener configured to secure the humeral support mount at a desired location relative to the rail clamp;
- a socket defined in the rail clamp; and

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a support arm including a base and a stabilizer bar extending from the base, wherein the base is configured to be inserted longitudinally in the socket.

2. The apparatus of claim 1, wherein the base is vertically adjustable in the socket relative to the rail clamp.

3. The apparatus of claim 2, wherein the stabilizer bar is pivotable relative to the base.

4. The apparatus of claim 3, further comprising a wrist support attachment disposed on the stabilizer bar.

5. The apparatus of claim 4, wherein the wrist support attachment includes a wrist support mount disposed on the stabilizer bar and a wrist support bar extending from the wrist support mount.

6. The apparatus of claim 5, further comprising an attachment groove defined on the stabilizer bar, wherein the wrist support mount is mounted in the attachment groove.

7. The apparatus of claim 6, further comprising a reducer attachment disposed on the stabilizer bar.

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8. The apparatus of claim 7, wherein the reducer attachment includes a reducer attachment mount slidably disposed on the stabilizer bar.

9. The apparatus of claim 5, wherein the wrist support mount is moveable along the stabilizer bar.

10. The apparatus of claim 7, further comprising a humeral support attachment disposed on the humeral support mount on the rail clamp.

11. The apparatus of claim 3, further comprising a clamp groove on the rail clamp.

12. The apparatus of claim 11, wherein the clamp groove is a blind groove.

13. The apparatus of claim 11, wherein the clamp groove is a clearance groove open to the base when the base is disposed in the socket, wherein the position of the base in the rail clamp is visible in the socket through the clamp groove.

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